WHAT IS CLAIMED

1   1. A control unit for facilitating multipoint communication between a plurality of

2   endpoints, each endpoint including at least a microphone and a speaker, each endpoint

3   being operative to send a compressed audio input signal to the control unit and receive

4   a compressed output signal from the control unit, the control unit comprising:

5   at least one audio module, each audio module receiving compressed audio input

6   signals from at least one endpoint and sending compressed audio output

7   signals to at least one endpoint of said plurality of endpoints, each audio

8   module including

9   at least one audio port logical unit, each audio port logical unit

10   being assigned to at least one endpoint within a

11   conference and being operative to handle audio signal

12   processing required by the endpoints associated with said

13   audio port logical unit;

14   an audio controller logical unit; and

15   a common interface to route compressed audio streams to and

16   from at least one audio module such that operation of the

17   audio port logical unit eliminates a need for a central

18   audio signal processing logical unit for the conference.

1   2.   The control unit of claim 1, wherein the audio port logical unit receives the

2   compressed audio input signal and sends the compressed audio output signal to at least

3   one endpoint, each audio port logical unit comprising:

4   a decoder that receives the compressed audio input signal from an appropriate

5   endpoint and decodes the compressed audio input signal to form a

6   decoded audio signal;

7   an analyzing and enhancing unit that analyzes the decoded audio signal and

8   sends the decoded audio signal to the common interface;

9   a switch that selects from the common interface decoded audio signals from

10   appropriate audio port logical units;

11   a mixer that mixes the selected decoded audio signals; and

12   an encoder that encodes an output signal of the mixer and sends an output of the

13   encoder via the common interface to at least one appropriate endpoint.

1   3.   The control unit of claim 2 wherein the analyzing and enhancing unit also enhances

2   the decoded audio signal.

1   4.   The control unit of claim 2, wherein the audio port logical unit further comprises:

2   a system format encoder between the analyzing and enhancing unit and the

3   common interface, said system format encoder receives the decoded

4   audio signal from the analyzing and enhancing unit and encodes the

5   decoded audio signal into a system format and sends the system

6   formatted audio signal to the common interface; and

7   a system format decoder between the switch and the mixer, said system format

8   decoder receives a formatted audio signal from the switch and performs

9   an operation that is the inverse of an operation performed by said system

10   format encoder and sends the decoded audio signal to the mixer.

1   5. A system comprising:

2   a plurality of audio ports between which audio signal processing of a conference

3   is distributed.

1   6. The system of claim 5, wherein the audio signal processing includes mixing of at

2   least one audio signal.

1   7. The system of claim 5, wherein the audio signal processing includes analyzing the

2   audio signal.

1   8. The system of claim 5, wherein the audio signal processing includes enhancing the

2   audio signal.

1   9. The system of claim 6, further comprising one or more audio controllers that

2   communicate with the plurality of audio ports to control the mixing.

1   10. The system of claim 9 wherein the one or more audio controllers form a centralized

2   management system for the conference.

1   11. The system of claim 9 further comprising a switch that

2   selects which signals will be mixed by a mixer, and

3   is controlled by the one or more audio controllers.

1   12. The system of claim 11 further comprising an encoder for encoding output of the

2   mixer.

1   13. The system of claim 12 further comprising a common interface that receives output

2   from the encoder.

1   14. The system of claim 11 further comprising a control buffer for storing control

2   instructions from the one or more audio controllers for the mixer and the switch.

1   15.   The system of claim 11 further comprising a control channel interface for

2   broadcasting control instructions from the one or more audio controllers to the plurality

3   of audio ports.

1   16. The system of claim 11 further comprising an information channel for broadcasting

2   control information from the plurality of audio ports to the one or more audio

3   controllers.

1   17. The system of claim 5 wherein the plurality of audio ports further comprise an

2   analyze and enhance unit that

3   analyzes an audio stream;

4   outputs an enhanced audio stream; and

5   outputs control information.

1   18.   The system of claim 17, wherein the plurality of audio ports further comprise a

2   decoder that decodes the audio stream before the audio stream is analyzed.

1   19.   The system of claim 18 further comprising a common interface for carrying

2   compressed audio streams to the plurality of audio ports to be decoded by the decoder.

1   20.   The system of claim 17, wherein the plurality of audio ports further comprise a

2   system format encoder that formats the enhanced audio stream.

1   21.   The system of claim 20 further comprising a common interface for broadcasting

2   the output of the system format encoder to the plurality of audio ports.

1   22. A system comprising:

2   a plurality of audio ports between which audio signal processing of a conference

3   is distributed, the signal processing including mixing at least one audio

4   signal, each one of the plurality of audio ports including

5   a decoder that decodes a compressed audio stream,

6   an analyze and enhance unit that analyzes the decoded audio

7   stream and outputs control information;

8   a switch that

9   selects audio signals to be mixed by a mixer, and

10   sends the audio signals to the mixer,

11   an encoder that encodes the audio signal mixed by the mixer,

12   one or more audio controllers that communicate with the

13   plurality of audio ports to control the mixer and the

14   switch forming a centralized management system for the

15   conference;

16   a control channel interface for broadcasting the control

17   information from the one or more audio controllers to the

18   plurality of audio ports;

19   an information channel for transferring the control information

20   from the plurality of audio ports to the one or more audio

21   controllers;

22   a compressed audio common interface that

23   carries the compressed audio stream to the plurality of

24   audio ports to be decoded by the decoder, and

25   receives output from the encoder; and

26   a system format common interface that

27   receives the decoded audio signal after it has been decoded by the

28   decoder, and

29   broadcasts the decoded audio signal to be received by the switch.

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1   23. The system of claim 22 further comprising

2   a system format encoder that formats the audio stream received from the

3   analyze and enhance unit and sends the formatted audio stream to the

4   system format common interface; and

5   a system format decoder between the switch and the mixer that performs

6   an operation that is an inverse of an operation of the system format

7   encoder.

1   24. The system of claim 22 wherein the analyze and enhance unit also enhances the

2   decoded audio stream.

1   25. A method comprising:

2   distributing audio signal processing of a conference between a plurality of audio

3   ports.

1   26. The method of claim 25, wherein the audio signal processing includes mixing at

2   least one audio signal.

1   27. The method of claim 25 further comprising centrally controlling the audio signal

2   processing of the plurality of audio ports.

1   28. The method of claim 27, wherein centrally controlling is performed by one or more

2   audio controllers.

1   29. The method of claim 28 wherein centrally controlling the audio signal processing

2   comprises selecting which signals to be mixed based on control instructions from one

3   or more audio controllers.

1   30. The method of claim 26 wherein the audio signal processing further comprises

2   encoding output of the mixing.

1   31. The method of claim 30, the audio signal processing further comprising

2   broadcasting the output from the encoding on a common interface.

1   32. The system of claim 29 further comprising transferring the control instructions

2   from the one or more audio controllers to the plurality of audio ports.

1   33. The method of claim 25 further comprising using at least one of the plurality of

2   audio ports for

3   analyzing an audio stream and

4   outputting control information.

1   34.   The method of claim 33, wherein the at least one of the plurality of audio ports

2   also performs enhancing of a decoded audio signal.

1   35.   The method of claim 33 further comprising transferring the control information

2   from the plurality of audio ports to one or more audio controllers.

1   36.   The method of claim 33 further comprising the at least one of the plurality of audio

2   ports decoding the audio stream before the audio stream is analyzed.

1   37.   The method of claim 36, wherein the audio stream is derived from a compressed

2   audio stream, the method further comprising transferring the compressed audio stream

3   from a common interface to the plurality of audio ports to be decoded.

1   38.   The method of claim 34 further comprising formatting the decoded audio stream.

1   39.   The method of claim 38 further comprising broadcasting the formatted decoded

2   audio signal to the audio ports.

1   40.   The method of claim 34 further comprising formatting the enhanced audio stream.

1   41. A method comprising:

2   broadcasting an output of audio signal processing of a conference

3   between a plurality of audio ports, the audio signal processing

4   including

5   receiving a compressed audio stream,

6   decoding the compressed audio stream,

7   analyzing the output of the decoding,

8   generating control information,

9   enhancing the output of the decoding to

10   form an enhanced audio stream,

11   outputting control information, and

12   formatting the enhanced audio stream;

13   broadcasting output of the formatting;

14   broadcasting the control information from the plurality of audio

15   ports to the one or more audio controllers;

16   selecting formatted audio signals based on the broadcast

17   instructions;

18   mixing the selected signals;

19   encoding output of the mixing; and

20   broadcasting the output from the encoding on a common interface.

1   42. A method comprising:

2   distributing audio signal processing of a conference between a plurality

3   of audio ports, the audio signal processing including

4   receiving a compressed audio stream,

5   decoding the compressed audio stream,

6   analyzing the output of the decoding,

7   generating control information,

8   enhancing the output of the decoding to

9   form an enhanced audio stream,

10   outputting control information, and

11   formatting the enhanced audio stream;

12   broadcasting output of the formatting;

13   broadcasting the control information from the plurality of audio

14   ports to one or more audio controllers;

15   selecting formatted audio signals based on the broadcast control

16   information;

17   mixing the selected formatted audio signals;

18   encoding output of the mixing; and

19   broadcasting the output from the encoding on a common interface.

1   43. A method comprising:

2   distributing audio signal processing of a conference between a

3   plurality of audio ports, the audio signal processing

4   including

5   receiving a compressed audio stream,

6   decoding the compressed audio stream,

7   analyzing the output of the decoding and generating

8   control information,

9   outputting the control information, and

10   formatting the decoded audio stream,

11   broadcasting output of the formatting;

12   broadcasting the control information from the plurality of audio

13   ports to one or more audio controllers;

14   selecting formatted audio signals based on the broadcast control

15   information;

16   mixing the selected formatted audio signals;

17   encoding output of the mixing; and

18   broadcasting the output from the encoding on a common interface.

1   44. A method comprising:

2   distributing audio signal processing of a conference between a

3   plurality of audio ports, the audio signal processing

4   including

5   receiving a compressed audio stream,

6   decoding the compressed audio stream,

7   analyzing the output of the decoding and

8   generating control information, and

9   enhancing the output of the decoding to form an enhanced audio

10   stream,

11   outputting the control information,

12   broadcasting the enhanced audio stream;

13   broadcasting the control information from the plurality of audio

14   ports to one or more audio controllers;

15   selecting decoded audio signals based on the broadcast control

16   information;

17   mixing the selected decoded audio signals;

18   encoding output of the mixing; and

19   broadcasting the output from the encoding on a common interface.